

# Dental Fear Among University Students: Implications for Pharmacological Research

**Tarja Kaakko, DDS,\*† Peter Milgrom, DDS,\* Susan E. Coldwell, PhD,\* Tracy Getz, MS,\* Philip Weinstein, PhD,\* and Douglas S. Ramsay, DMD, PhD, MSD\*‡**

\*Department of Dental Public Health Sciences, University of Washington, Seattle, Washington, †Institute of Dentistry, University of Helsinki, Finland, and ‡Departments of Orthodontics and Pediatric Dentistry, University of Washington, Seattle, Washington

University students are often subjects in randomized clinical trials involving anxiolytic and analgesic medications used during clinical dental and medical procedures. The purpose of this study was to describe a typical university student population available for research by using data from a mail survey. Subjects were 350 students chosen randomly from all enrolled, full-time, traditional students on the main campus at the University of Washington in Seattle, WA. The aim was to determine the extent and nature of dental anxiety in this population. In addition, the relationships between subject willingness to receive dental injections and general and mental health and medical avoidance and medical fears were examined. The Dental Anxiety Scale (DAS) was used to measure dental anxiety. Dental anxiety was prevalent in this population; 19% of students reported high rates of dental fear. Thirteen percent of students had never had a dental injection. Students with no experience with dental injections were more reluctant than those with experience to receive an injection if one were needed. DAS scores were correlated with injection reluctance. Students who were reluctant to go ahead with a dental injection also reported poorer general and mental health than those who were less reluctant. These students also reported higher medical avoidance and medical anxiety scores. University students provide a rich source of potential subjects for clinical research. The student population, like the community at large, contains people with high levels of dental and medical fear.

**Key Words:** Dental anxiety; Prevalence; Dental anesthesia; Injections; Avoidance learning; Patient participation; Patient selection; Randomized clinical trials.

**S**tudies of analgesic and sedative agents often employ the third molar extraction model in young adults.<sup>1-5</sup> University students are readily available for these studies and are often recruited using the promise of free treatment. The potential to generalize results obtained from this relatively homogeneous population could be questioned.<sup>6,7</sup>

Most studies recruit subjects for third molar studies without attention to preexisting dental anxiety levels. Researchers have assumed that dental surgery elevates anxiety in all subjects sufficiently enough to allow vari-

ation in response to the drugs that are being tested. However, often such studies lack variation in subject fear levels<sup>5,8,9</sup> and make it more difficult to find significant differences between agents. Fearful subjects should also be identified and recruited when testing pain medications, as research has shown that greater anxiety increases pain sensitivity. Patients report more pain when they are upset.<sup>10</sup> Recruiting such patients would enhance the utility of the research and would markedly increase our ability to make such research generalizable. However, recruiting anxious subjects may be difficult because of the tendency of such subjects to avoid treatment.<sup>11</sup> It is not known whether rates of dental fear in the university population are representative of rates in random community samples.

Previous studies have shown injections to be a major

Received February 9, 1998; accepted for publication June 12, 1998.

Address correspondence to: Dr. Tarja Kaakko, Department of Dental Public Health Sciences, University of Washington, Box 357475, Seattle, WA 98195-7475; kaakko@u.washington.edu.

Anesth Prog 45:62-67 1998  
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ISSN 0003-3006/98/\$9.50  
SSDI 0003-3006(98)

source of overall dental fear.<sup>12</sup> In studies of anxiolytic and analgesic agents where the third molar model is common, it is essential to be able to tolerate dental injections. However, increasing numbers of students have had no direct experience with dental injections because the prevalence of dental caries has declined.<sup>13,14</sup> Fears arise primarily from direct contact with dentistry, while some are communicated indirectly through other people or the mass media. However, fearful populations are heterogeneous.<sup>15</sup> Some individuals who have never experienced dental trauma may have acquired their fear in similar nondental situations. Such persons may have experienced fear or pain in other medical settings and may avoid medical care.<sup>12,16</sup>

As part of a larger study of behavioral therapy and anxiolytic agents, we examined fear levels in a university student population. The primary goal of the study was to determine the extent and nature of fears, particularly fear of dental injections, in the university student population in order to determine whether the incidence of dental fear would be adequate to recruit fearful subjects from this population. A second aim of the study was to test hypotheses generated by the conditioning theory of phobia acquisition.<sup>17-19</sup> It was expected that fear of injections developed from direct contact with dental injections and earlier traumatic experiences with dental injections or during similar kinds of situations (ie, medical situations). We hypothesized that (1) respondents with no experience with dental injections would have lower scores for dental injection cognitions; (2) students who had not experienced dental injections would be less reluctant to go ahead with a dental injection if one were needed; and (3) students who were reluctant to go ahead with a dental injection would report their current perceived general and mental health as being poorer and would report higher medical anxiety and medical avoidance scores.

## METHODS

### Sample

Subjects consisted of 350 students chosen randomly from all enrolled full-time students on the main campus at the University of Washington. The total number of students at the University of Washington is approximately 35,000. Students were surveyed by mail. This research was approved by the Institutional Review Board of the University of Washington; individual survey results were confidential.

### Instrumentation

A 23-question, 69-item questionnaire was constructed following the principles of the Total Design Method.<sup>20</sup>

The questions asked respondents to rate dental fears and to provide responses to questions about dental health and demographics. A subset of the questionnaire items is described in this report. The survey instrument was pretested and found to have adequate internal consistency. Other properties of the instrument are described elsewhere.<sup>21</sup>

Self-reported anxiety was measured using the DAS.<sup>22</sup> This instrument includes four questions (relating to anxiety about a dental appointment if it was going to occur tomorrow, anxiety in a dentist's waiting room, anxiety while waiting for a tooth cleaning, and anxiety while waiting for drilling); each response was given a score from 1 to 5, and scores were totaled (4-20 points) for analysis. A higher score indicates greater anxiety about the dentist. Additional questionnaire items were constructed from items in the other surveys or as modifications of similar general fear items,<sup>23</sup> all of which had well-established reliability and validity.

Subjects were asked specifically about dental injections, which are a significant source of fear among the general population.<sup>24</sup> Each student was asked to imagine the dental situation and to estimate the probability that he or she would allow the dentist to proceed with an injection. The probability (that the subject would allow the practitioner to administer the injection) ranged from 0 to 100%. Each respondent was asked if he/she had ever had a dental injection and if so, when. The scores ranged from "never" to "less than 12 mo ago."

The questionnaire included 18 questions designed to capture the cognition of the respondents regarding dental injections.<sup>21</sup> These fears are measured along four dimensions; the scores for each dimension range from 1 (not at all true) to 5 (absolutely convinced this is true). The dimensions are general fear of dental injections, including pain from injections; fears related to local anesthetic (side effects, inadequate local anesthesia); fears of acquiring disease; and fears of bodily injury from injection.

The mental health measure consisted of four questions (Have you been a very nervous person? Have you felt so down in the dumps that nothing could cheer you up? Have you felt downhearted and blue? Have you been a happy person?); the questions also asked the amount of time the respondent had experienced these emotions during the past 4 wk. The questions were adapted from the SF-36 Health Survey.<sup>25</sup> Subjects were asked to rate symptoms on a six-point scale. These categories were scored from 1 to 6 (all to none) for negatively worded statements (downhearted, blue, and nervous) and from 6 to 1 (all to none) for positively worded statements (happy person). The scale scores were transformed to range from "none of the time" (100) to "all of the time" (0). The transformation formula reported

in the SF-36 Health Survey manual was used to calculate to final score of the scale.<sup>25</sup> The mean score on the mental health scale among the general U.S. population was 74.7 (SD 18.1), the mental health score in the 25th percentile was 64.0, median score was 80.0, and the score in the 75th percentile was 88.0.<sup>25</sup>

Measure of medical fears consisted of placing subjects into three medical situations (involving a shot in the upper arm, blood drawing, and a shot in the buttocks). Students were asked to rate their avoidance behavior in these situations on a three-point scale, where 1 represents "never avoid" and 3 represents "always avoid." If the students had never been faced with the situation described, they were asked to imagine themselves in the situation and then respond. Students were also asked to describe how much anxiety they would experience if they actually were in these situations. Students were asked to rate their answers on five-point scale from "no anxiety" (1) to "great anxiety" (5). The mean scores of all three measures of medical anxiety and medical avoidance were used in the analyses.

### Survey Procedure

The subjects were surveyed by mail at home addresses. The initial questionnaire mailing included an incentive in the form of a tooth-shaped notepad. A follow-up postcard was sent at 1 wk, and follow-up questionnaires were mailed to nonrespondents at 4 and 9 wk.

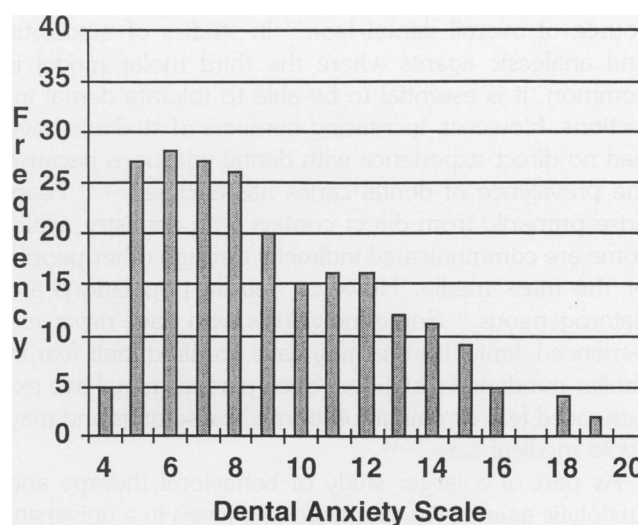
### Analyses

Simple descriptive statistics were obtained using the frequency procedure of the Statistical Analysis System.<sup>26</sup> Pearson correlation was used to test the hypothetical association between DAS and willingness to go ahead with dental injections. Contingency table analysis ( $\chi^2$ ) was used to investigate the hypothesis that the students with no experience with dental injections would be less reluctant to go ahead with a dental injection if one were needed. Student's *t*-tests were used to examine differences in dental injection cognitions for subjects with and without previous dental injection experience. Student's *t*-tests were also used to examine differences between willingness to go ahead with a dental injection and dental injection cognitions, mental and general health, and medical fears.

## RESULTS

### Survey Response

The response rate was 66% (232/350 responding). Not all respondents answered every question, so the sample



**Figure 1.** Distribution of Dental Anxiety Scale (DAS) scores among University of Washington students. *N* = 232.

sizes in individual analyses vary. The mean age of students was 23 yr (range: 16–58 yr), and 55% of the respondents were female. Most of the students (85%) were undergraduates. Most respondents were white (59.8%; 137/229), 26.6% were Asian or Pacific Islanders (61/229), 4.4% were African American (10/229), and the remainder indicated some other racial background. The proportion of men and women and racial characteristics were consistent with those of the entire University of Washington student population.

### Dental Anxiety and Dental Injections

The mean DAS score among students was 9.2 (SD = 3.4). The proportion of students reporting high dental fear (DAS  $\geq$  13) was 19% (43/223). The distribution of DAS scores is presented in Figure 1. The typical respondent had received a dental injection within the past 2 yr. Thirteen percent (30/230) had never had a dental injection. The typical subject would always allow a dental injection if one were needed. However, 15% of respondents (34/226) rated their probability of going ahead with the injection at 60% or less. Another 25% (56/226) rated the probability of going ahead with the injection at 80%. The four needle-fear cognitions were rated from 1 (not at all true) to 5 (absolutely convinced this is true). The overall mean levels of needle-fear cognitions were general fear, including pain of injection (2.2; SD = 1.0); fears of bodily injury (2.2; SD = 0.8); fears of acquiring disease (1.7; SD = 1.0); and fears related to local anesthetic, including fear of side effects and prolonged numbness (1.5; SD = 0.6).

**Table 1.** Number and Percentage of Students Who Would or Would Not Go Ahead With Dental Injection if One Was Needed Among Those With No Experience With Dental Injection and Among Those With Earlier Experience With Dental Treatment<sup>a</sup>

	Had Experience With Dental Injections	No Experience With Dental Injections
	Number (%)	Number (%)
Would not go ahead with dental injection	23 (11.4)	11 (36.7)
Would go ahead with injection	179 (88.6)	19 (63.3)

<sup>a</sup>  $\chi^2 = 13.3$ ;  $P < 0.001$ ;  $N = 232$ .

### Experience and Fear of Dental Injections

Those respondents who had never had an injection differed from those who had previous experience with injections in three cognitive dimensions of fear related to local anesthetic (mean 2.4 [SD = 1.0] vs mean 2.2 [SD = 0.8];  $t = 2.5$ ,  $P < 0.01$ ); fears of acquiring disease (mean 2.1 [SD = 1.3] vs mean 1.7 [SD = 0.9];  $t = 2.1$ ,  $P < 0.03$ ); and fears of bodily injury from injection (mean 2.5 [SD = 0.9] vs mean 2.2 [SD = 0.8];  $t = 2.2$ ,  $P < 0.03$ ). The differences for general fears leaned in the same direction, but the two groups were not significantly different.

### Willingness to Proceed With a Dental Injection

Respondents who were  $\leq 60\%$  likely to go ahead with an injection had higher scores on three of the four cognitive dimensions of injection fear. In this case, the differences were for general fear of injections (mean 3.0 [SD = 1.1] vs mean 2.1 [SD = 0.9];  $t = 4.6$ ,  $P < 0.001$ ); fears related to local anesthesia (mean 1.8 [SD = 0.7] vs mean 1.4 [SD = 0.5];  $t = 3.4$ ,  $P < 0.0007$ ); and fears of bodily injury from injection (mean 2.7 [SD = 0.9] vs mean 2.1 [SD = 0.8];  $t = 3.8$ ,  $P < 0.0005$ ). The differences for fears of acquiring disease leaned in the same direction, but the two groups were not significantly different.

### General Health and Medical Avoidance

The typical respondent reported perceived general health as very good (85/228, 37.3%), mean score 2.0 (SD = 0.9), where 1 represents "excellent" and 5 indicates "poor." Of the remainder, the proportion of the university students reporting "excellent" general health was 32.0% (73), those reporting "good," 25.9% (59), and those reporting "fair," 3.9% (9); two respondents reported "poor" general health.

The typical student respondent scored a 72.4 (SD 15.4) on the mental health scale of 100 to 0 where 0 indicated maximum distress. Twenty-four percent of subjects had scores of 64 or lower, indicating that symptoms of anxiety or depression were present at least some of the time.

Mean scores on the medical avoidance measure were 1.5 (SD = 0.57), where the range is from 1 to 3, with a higher score indicating greater avoidance. Nearly 59% of subjects (58.8%, 134/228) indicated that they sometimes avoid medical injections or having blood drawn. The mean anxiety score was 2.6 (SD = 1.1) where the scores ranged from "no anxiety" (1) to "great anxiety" (5). Over 38% of subjects (87/228) had mean scores of 3 or greater, indicating "some," "much," or "great" anxiety regarding medical procedures or blood drawing.

### Relationship Between Willingness to Go Ahead with Dental Injections and the DAS

The behavioral measure of willingness to go ahead with dental injections is correlated with the DAS ( $r = 0.33$ ,  $P < 0.001$ ). Subjects with greater dental anxiety are more reluctant to allow injections than are those with less anxiety. The mean DAS scores do not differ significantly between subjects who have (9.2; SD = 3.5) or have not had (9.1; SD = 3.5) a previous dental injection. On the other hand, subjects who had not previously experienced dental injections were more likely to try to avoid injections (Table 1).

### Relationship Between Willingness to Receive a Dental Injection and General and Mental Health Variables

Levels of self-reported general health and of mental health are significantly poorer in subjects who would avoid dental injections, although the magnitude of the differences is relatively small. The results are summarized in Table 2.

## DISCUSSION

This research emphasizes that university students with various degrees of dental anxiety should be recruited as subjects for randomized clinical trials of anxiolytic and analgesic medications using the third molar model. Almost one in five of these young people reported high levels of dental fear. The high level of dental fear in this

**Table 2.** The Mean Scores and Standard Deviations (SD) of Mental Health, General Health, Medical Avoidance and Medical Anxiety Among Students Who Are Willing to Go Ahead With Dental Injections if One Was Needed and Among Students Not Willing to Go Ahead With Injections<sup>a</sup>

	Willing to Go Ahead With Dental Injection <sup>b</sup>	Not Willing to Go Ahead With Dental Injection	t-Value (P < Value)
Mental health <sup>c</sup>	73.2 (15.2)	67.6 (15.4)	2.0 (P < 0.05)
General health <sup>d</sup>	2.0 (0.9)	2.4 (1.0)	2.3 (P < 0.02)
Medical avoidance <sup>e</sup>	1.4 (0.5)	1.8 (0.7)	3.1 (P < 0.004)
Medical anxiety <sup>f</sup>	2.5 (1.0)	3.3 (1.0)	4.2 (P < 0.0000)
Age	23.2 (6.2)	22.3 (3.7)	-1.1 (P < 0.26)

<sup>a</sup> N = 232.<sup>b</sup> The probability of going ahead with an injection ranges from 100% (score 1) to 0% (score 5). This measure was dichotomized at 100% vs 60% or less.<sup>c</sup> Mental health score ranged from 100 to 0, where 100 equates no symptoms of anxiety and depression.<sup>d</sup> General health score ranged from 1 to 5, where 1 means "excellent" and 5 means "poor."<sup>e</sup> Medical avoidance score ranged from 1 to 3, where 1 means no avoidance.<sup>f</sup> Medical anxiety score ranged from 1 to 5, where 1 means no anxiety.

student population is comparable to that found in an earlier representative community sample.<sup>24</sup> The representation of nonwhites was higher in the student population than in the community sample. The data suggest that ethnic minorities are overrepresented in the student population. It is well recognized that fear levels influence self-reports of the effectiveness of anxiolytics and analgesics.<sup>10</sup> It is important that these concerns be accurately assessed in clinical studies to better understand the results obtained. The recruitment of fearful subjects from the student population is possible, as the incidence of dental fear is similar to that in the community.

Contrary to our hypothesis, students with no experience with dental injections reported higher scores for dental injection cognitions than did students with earlier experience with dental injections. These students were also more reluctant to receive a dental injection compared with the experienced group. Our hypothesis was based on conditioning theory. Greater fear of dental injections among people without experience is not readily explained by this theory. According to Rachman,<sup>27</sup> there are three pathways of fear acquisition: direct contact with the feared stimulus, vicarious acquisition, and informational acquisition. Two other pathways could better account for our results. Students without experience with dental injections may have acquired the fear through a variety of observational and instructional experiences that communicate negative information. For example, fear might have been acquired through similar medical experiences. Sources of informational acquisition might also be friends, relatives, and the mass media.

The proportion of young people who are caries free and who have never had a dental injection is increasing.<sup>13,14</sup> During clinical dental procedures and third molar surgery, it is essential that the patient be able to tol-

erate dental injections. Fifteen percent of students surveyed rate their probability of going ahead with a dental injection at 60% or less. More than 1 in 10 students have never experienced a dental injection and are more fearful than the overall population. The dental injection is one of the most commonly reported reasons for dental anxiety.<sup>12</sup> Without special preparation, these students may not be willing to participate in clinical research (which demands the ability to tolerate injections), especially when there is a possibility of receiving a placebo instead of active medication. The recruitment process may therefore become more difficult.

A related problem is IV placement and blood draws for delivery of agents or for determining kinetics or pharmacodynamics. Our results suggest that 38% of students surveyed expressed anxiety regarding medical procedures and blood draws. Fifty-nine percent of respondents had avoided medical injections and blood draws in the past. Medical and dental avoidance were related. The mean scores of medical avoidance and anxiety were higher among students who were unwilling to experience dental injections. Similarly, decreases in general and mental health are related to avoidance of dental injections. A similar result was seen in university employees.<sup>28</sup>

This research points to the need to pay careful attention to levels of fear when recruiting university students as subjects for clinical studies of anxiolytic and analgesic medications. It suggests that special strategies will be required in order to successfully enroll subjects who are broadly representative of the world of young people. Recruitment efforts should be broad and varied and should be conducted using a variety of sources, such as universities, local and university newspapers, magazines, radio, and television. Some of the recruitment advertisements should be targeted to the population that

is anxious and that tends to avoid dental treatment, demonstrating sensitivity to anxiety and the capability of dealing with anxious patients. Careful thought should be given to how these potential subjects are handled during telephone screening. All the candidates should be interviewed in advance about their fear level and their previous experiences with dental treatment. Subjects who have never had a dental injection should be recruited to increase variability and the potential for finding significant differences as well as to increase the ability of the researchers to meet National Institutes of Health and Food and Drug Administration requirements for broadly representative research populations.<sup>11</sup> Recruitment efforts should be documented.

## ACKNOWLEDGMENTS

This research was supported, in part, by grant nos. DE10735, DE00379, and DE07132 from NIH/NIDR and a stipend from the University of Helsinki, Finland.

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